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Williston Reservoir Fish Assessments 2000, Pelagic Netting Summary

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Abstract

Assessments of fish populations were conducted on Williston Reservoir during the summer of 2000. Hydroacoustic and trawl surveys were conducted to evaluate trends in species assemblage, total biomass, and spatial distribution of the pelagic fish populations of Williston Reservoir. Pelagic netting, undertaken concurrently with the hydroacoustic and trawl surveys, corroborated the results of the hydroacoustic and trawl studies. This report focuses on the pelagic netting aspect of the fish population assessments. Pelagic netting was accomplished by the use of floating gillnets (overnight sets) at seven Williston Reservoir locations. The netting yielded five fish species and a total of 679 fish. The species captured in order of relative abundance were; lake whitefish (*Coregonus clupeaformis) 45%*, peamouth chub (*Mylocheilus caurinus) 25%*, rainbow trout (*Oncorhynchus mykiss*) 20%, kokanee (*Oncorhynchus nerka) 8%*, and bull trout (*Salvelinus confluentus) 2%*. Statistical analysis indicates that there were significant differences (HSD Tukey, α 0.05), amongst sampling locations for lengths and weights of rainbow trout, peamouth chub, and lake whitefish.

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Introduction

As part of BC Hydro's commitment to monitoring, assessing, and mitigating the impacts of the W.A.C Bennett Dam impoundment, intensive assessments of Williston Reservoir's fish species assemblage and biomass have occurred in 1974, 1988 and 2000. In 2000 assessments studies were again undertaken to determine trends in fish populations and assemblages as compared to prior assessments, such as those completed by Peace/Williston staff (Blackman 1992) and Canadian BioSonics Ltd. (Johnson and Yesaki 1989) during the summer of 1988, and those completed by Barrett and Hasley in 1974-75.

This report summarises the results of the pelagic netting component of the fish population investigations that occurred on Williston Reservoir during the period of August 25 to September 3, 2000. The data in this report will be used by BC Fisheries staff in conjunction with their hydroacoustic and trawl surveys data to develop a fish population and biomass estimate for Williston Reservoir. A comprehensive report will be produced by BC Fisheries incorporating the results of all three studies.

As stated in the survey workplan by Sebastian (2000), the objectives of the 'Williston Reservoir- Hydroacoustic and Trawl Reconnaissance Level Survey' were to:

1. *Provide baseline data for determining the species composition and abundance of forage fish in limnetic habitat on Williston Reservoir.*
2. *To evaluate the usefulness of standard large lake fish stock assessment techniques used in Southern BC to Williston Reservoir.*
3. *To determine if gillnetting information can be useful in interpreting hydroacoustic information.*
4. *To recommend methods for further assessment of fish stocks in Williston Reservoir.*

Study Area

Williston Reservoir is located in northeastern British Columbia (Figure 1), approximately 200 km north of Prince George. Williston Reservoir is the largest fresh-water body in British Columbia, having a surface area of 177, 300 hectares and a maximum volume of 74 billion cubic metres at full supply (BC Hydro 1996). The drainage catchment area is 69,930 km^2. Williston Reservoir is made up of three basins or "Reaches" (Peace, Parsnip, and Finlay). The reservoir's shape and orientation is that of a sideways "T" (⊢). The Parsnip and Finlay Reaches extend a total of approximately 220 km in a south to north orientation along the western side of the Rocky Mountain Trench. At the "Junction" the Peace Reach receives waters from the Finlay and Parsnip and then extends eastward through the Rocky Mountains for 120 km to the W.A.C. Bennett Dam. The drainage continues to the Peace River and ultimately the Arctic Ocean. An extensive description of the Williston watershed is available in Stockner and Langston (2000).

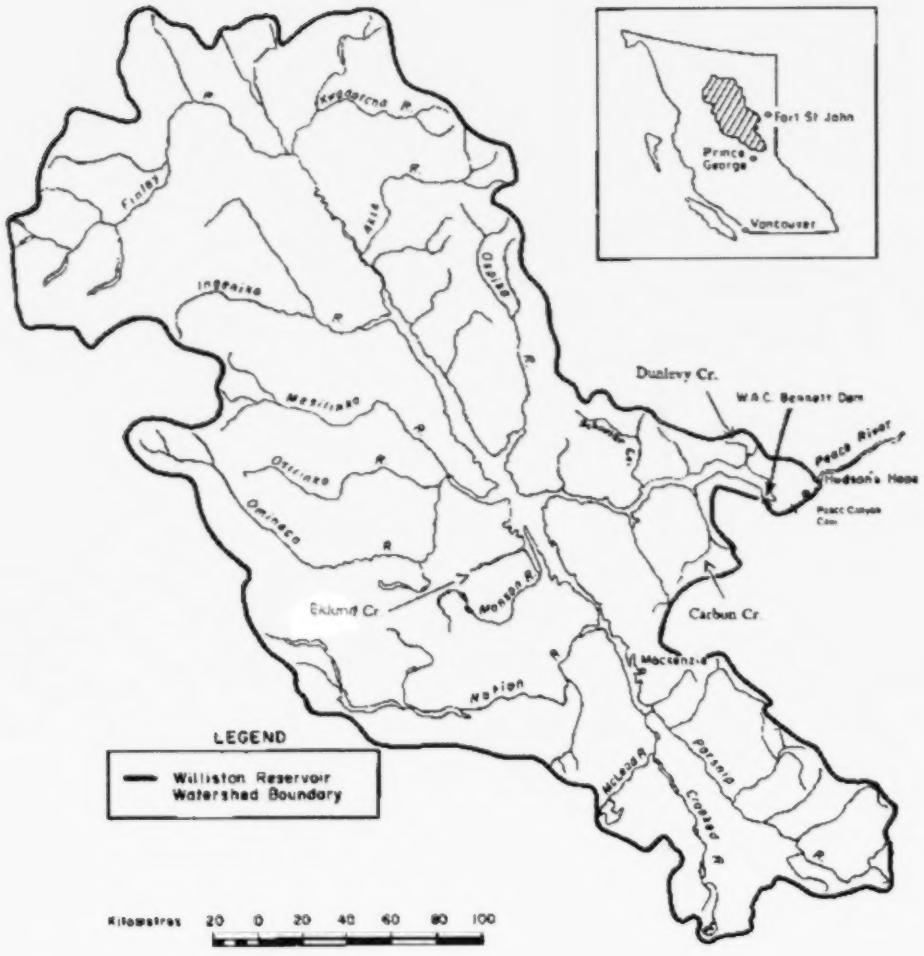

Figure 1. Williston Reservoir Watershed

Methods

Netting (pelagic gill nets)

Pelagic (limnetic) habitat sampling locations were, as closely as possible, duplicated from the pelagic gill netting locations used by Blackman in 1988.

The echograms produced by BioSonics in 1988 were used to aid in selection of sample (netting) locations. The echograms were overlaid with the most recent GIS mapping data of the reservoir to produce a crude bathymetric chart, allowing identification of deep water (old river channels) in relation to the shoreline (Scholten 2000, pers. comm.). Hydroacoustic and trawl locations were then identified with gillnetting sites complimenting each sampling location (Figure 2). Two additional sites, Factor Ross and Heather Point, were sampled (netted, and hydroacoustic), but not trawl netted due to shallower water depths.

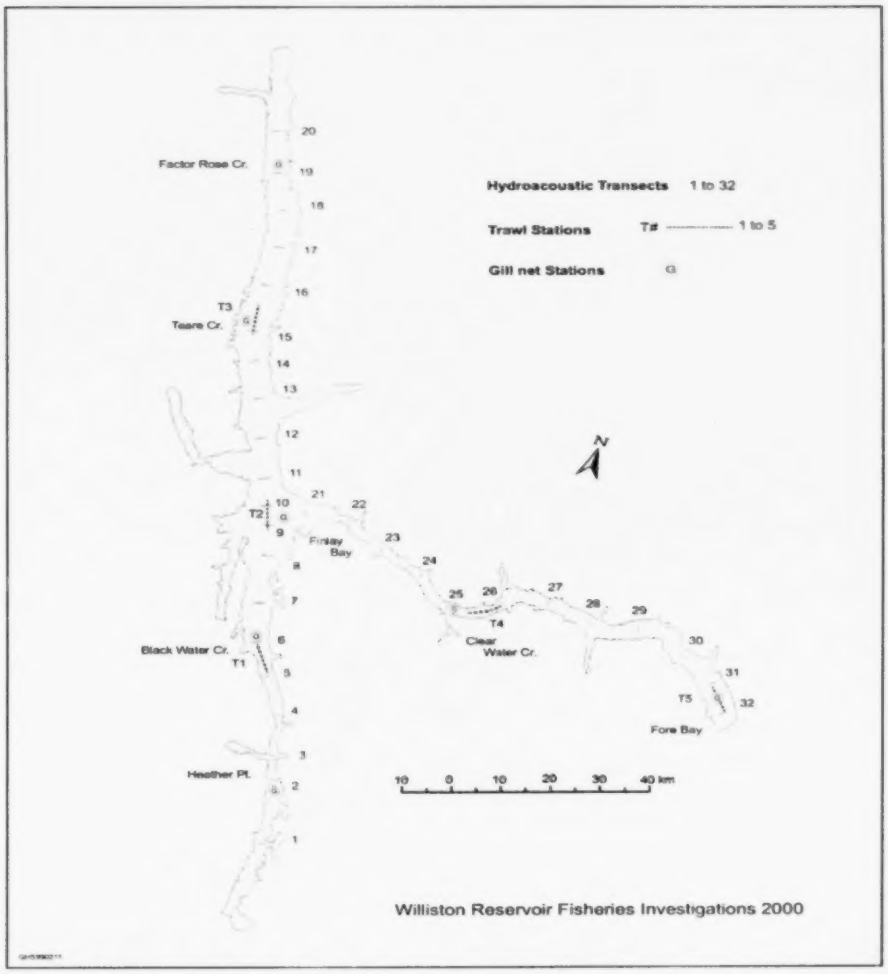

Figure 2. Gillnetting, trawl and hydroacoustic sampling locations that occurred as part of the Williston Reservoir Fisheries Investigations. Adapted from Scholten (2000).

Floating monofilament "experimental" nets were used to capture fish. Each net was 2.4 m deep and 94.1 m long. Each net was comprised of six panels, 2.4 m deep and 15.3 m long, connected "end-to-end" to extend 94.1 m. Stretch mesh sizes of the six panels were 25 mm, 76 mm, 51 mm, 89 mm, 38 mm, and 64 mm. The nets were set at pre-determined sampling locations (Factor Ross, Teare Creek, Finlay Junction, Clearwater Creek, Forebay, Blackwater Creek, and Heather Point) in areas closely associated with the trawl and hydroacoustic surveys. At each sampling location, three "experimental" nets were set overnight. Each net was set parallel to the shoreline along the old river channel. The nets were set "end-to-end" with a 50 m gap between each of the three nets.

Six, A4 Scotchman buoys (two for each net set) were used to provide boater identification of netting sites. Anchoring of nets was accomplished by using 8mm-poly trawl twine, connected to sand or boulder filled plastic garbage bags. The use of "tear away" garbage bags ensured retrieval of anchor lines where submerged trees were abundant. Carabiners were used to assist in quick and efficient net set and retrieval at the anchor points and buoy to net junctions (Figure 3).

To assist in locating the nets during inclement weather, GPS-coordinates were recorded at each site, using a Garmin XL 12 channel GPS. Nets were set and retrieved using a 24-foot aluminum jet boat.

Net retrieval during rough water conditions was accomplished by disconnecting the anchor line from the nets at the buoy junction, hooking a small buoy to the downwind end of the net, and repeating the same task at the upwind end. Once the nets were free of the anchors, the nets were pulled from the downwind side while drifting with the wind. The anchors were collected after the fish were pulled from the nets, or the nets were retrieved.

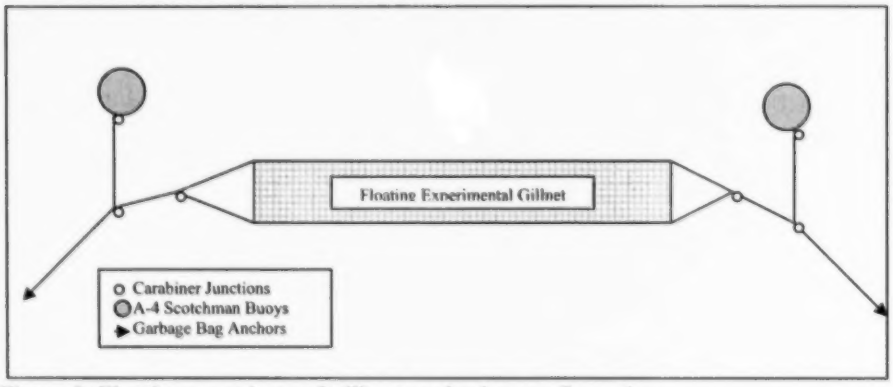

Figure 3. Floating experimental gill net anchoring configuration.

Fish Sampling

All fish captured in gillnets were sub-sampled (maximum of 30) for length to the nearest millimeter and weight to 0.1 grams. Weight was recorded using an Ohaus® 2100-gram Navigator™, electronic balance, accurate to 0.1 grams. Sex and maturity was recorded for rainbow trout (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), lake whitefish (*Coregonus clupeaformis*) and kokanee salmon

(*Oncorhynchus nerka*). Aging structures were collected for lake whitefish (otoliths), kokanee (scales), and for dead bull trout (otoliths/fin rays). Peamouth chub (*Mylocheilus caurinus*) were sampled for length and weight. Condition factors were calculated for all fish that were measured and weighed (appendix A, Table 2).

$$\text{Condition Factor (k)} = \{\text{Weight (g)} \div \text{Length}^3 \text{ (cm)}\} \times 100$$

Stomach contents were not recorded due to deterioration of contents that are normally associated with netting of pelagic fishes. Parasite presence was noted as general comments; where they were present they usually occurred in all fish sampled.

To help determine netting bias, fish species captured were tallied and recorded for each net panel (appendix B) while nets were being pulled. Fish were placed in numbered pails to avoid mixing results from each net.

Data Analysis

Where the sample size was greater than 10 or there was a similar catch across sites, single factor ANOVA was used to compare differences in length and weights for each species (α 0.05). To determine what sites were different when ANOVA indicated significant differences, HSD Tukey analysis were used ($\alpha = 0.05$). t-Tests (Assuming Equal Variances) were used ($\alpha = 0.05$) for comparing two sites for peamouth chub. Sites that had small sample numbers, with the exception of kokanee, were not statistically compared.

To help determine if weights and lengths were different between sites, where sample size was low, confidence intervals (95%) were calculated and presented graphically (Appendix D). A sample of five or greater was used because for $P < 0.05$ and n-1 degrees of freedom, the Student's t distribution decreases. For example, using a sample size of 3 and 5, the decrease in Student's t distribution is 1.55 x t =4.303 versus t= 2.776 for a sample of 5. Increases in sample size from 5 to 60 will decrease t by less than half that much, to t = 2.00. Therefore a minimum of five samples per location is used. The graphical presentation should be viewed with caution and should only be used as a qualitative comparison.

Results

Five fish species; peamouth chub, lake whitefish, kokanee salmon, rainbow trout, and bull trout, for a total of 679 fish (Table 1) were captured in the seven pelagic netting sites. Descriptive statistics (Table 2) show the number of fish sampled for each species of fish, as well as mean lengths, weights and condition factors. Catch per unit of netting effort was highest at Teare Creek, followed by Forebay and Junction (Table 1). Catch by panel (appendix B) shows that most fish (n=179) were captured in the 51mm panel, of which 115 were lake whitefish. The least effective panels were the 25mm (n=14) and the 76mm (n=14) panels.

Lake whitefish were the most abundant fish caught (Figure 4, 5), comprising of 44.9% of the total catch (n = 305), followed by peamouth chub at 27.8% (n = 189). Rainbow trout were the most abundant species at the Blackwater sampling location

(Table 1), which was instrumental in rainbow trout comprising 18.2% (n = 124) of the total catch. Kokanee comprised 7.5% (n = 50) of the total catch. Since sampling occurred when adult kokanee were entering spawning streams, a large component of the adult population may not have been present in pelagic zones. Bull trout, 1.6% (n = 11) of the total catch, were mostly large fish, and possibly alternate spawners that were not spawning in 2000.

Aging structures were collected from a total of 46 whitefish (otoliths) and 45 kokanee (scales). Otoliths, fin-rays and tissue samples were collected from the eight bull trout captured. Lake whitefish ages ranged from 2 to 10 years. Kokanee ages ranged from 2 – 6 years. The eight bull trout captured ranged from age 2 to 11 (appendix A).

Table 1. Summary of fish species and numbers caught by sample location

Fish Species	Forebay	Clearwater	Junction	Factor Ross	Teare Creek	Blackwater Creek	Heather Point	**Total**
Lake whitefish	53	1	64	56	114	7	10	**305**
Kokanee	13	5	12	7	7	4	2	**50**
Rainbow trout	23	9	21	6	3	58	4	**124**
Bull trout	1	1	2	2	2	0	3	**11**
Peamouth chub	126	6	28	8	7	1	13	**189**
TOTALS	**216**	**22**	**127**	**79**	**133**	**70**	**32**	**679**
***Hours**	**24**	**23**	**22.8**	**21.6**	**18.1**	**21.9**	**19.8**	
CPUE	**9.0**	**1.0**	**5.6**	**3.5**	**7.3**	**3.2**	**1.6**	

- Hours is the average fishing effort for the three nets set. Table 1 summary includes fish noted as released, decapitated, and sampled fish.

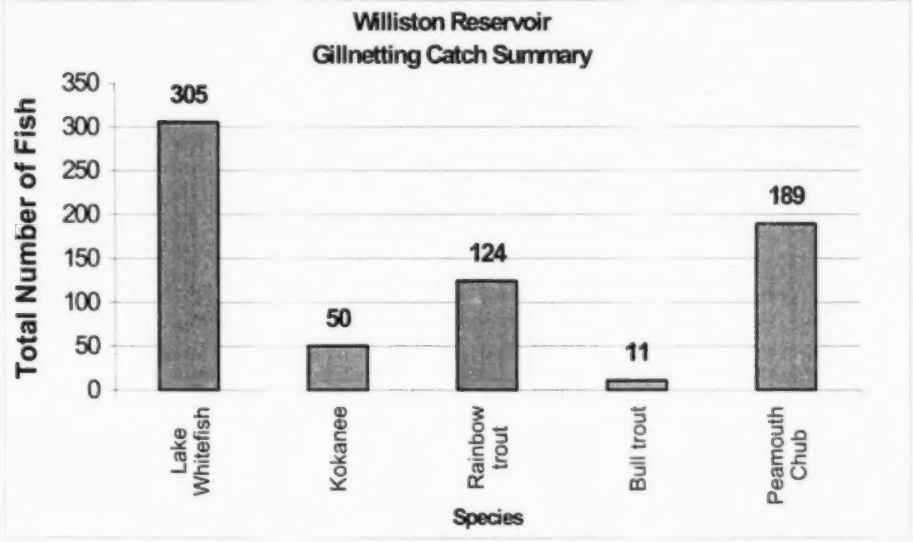

Figure 4. Species distribution of total catch from all seven gillnet sample locations.

When retrieving the three Forebay (east end of Peace Reach near W.A. C. Bennett Dam) location nets, it was noted that the nets were tangled, reducing their ability to capture fish. The tangling must have occurred over night. Despite the nets being tangled, the Forebay site produced the greatest numbers of fish (n=216) (Table 1, Figure 5).

The Clearwater (mid-Peace Reach site) site nets captured the fewest fish (n=22), corresponding to low fish numbers noted by hydroacoustic and trawl surveys (Scholten, pers. comm.). Rough water at the Clearwater site created difficulties in setting the nets, and upon retrieving the nets, it was found that the buoys at the upwind ends of the net had broken away from the net bridles for two of the nets, creating large rips in the first panel of two of the nets. Rough water and debris in the water had also caused several panels on two of the nets to become tangled, further reducing the nets fish catching capability.

The Junction site nets were set under calm conditions, no tangles occurred and the nets were not adversely affected by environmental conditions. There were a total of 127 fish captured at the Junction site. Whitefish (n=64) were the dominant species present.

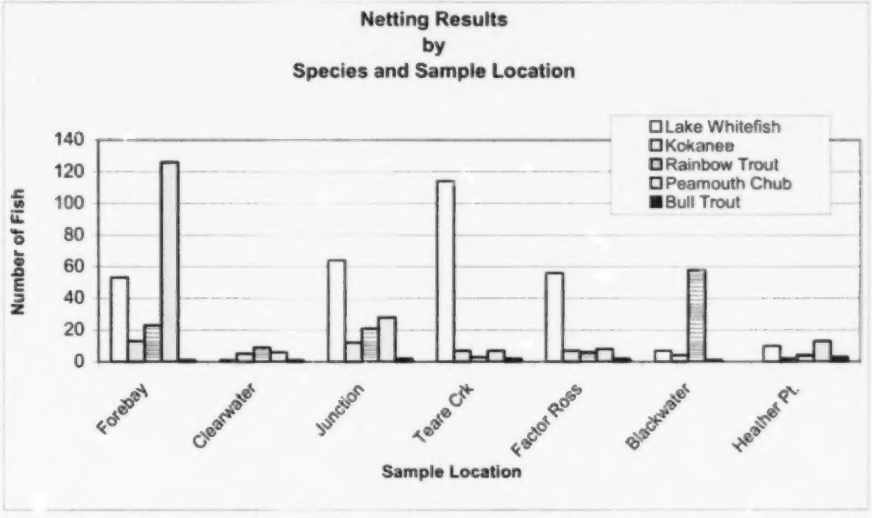

Figure 5. Comparison of the number of fish captured by species and sample location.

Factor Ross location (northern most Finlay Reach site) nets were set under calm conditions and retrieved from very rough water, but the nets were not tangled while set for fish capture and therefore the nets ability to capture fish was not affected. Seventy nine fish were captured at the Factor Ross location, most (56) were lake whitefish.

Teare Creek (mid-Finlay Reach site) nets were set under rough water conditions and were pulled under very rough conditions. It is not clear if the netting success was affected by the weather conditions, but the nets at this location captured

the second most fish (n=133) of all sites. A very large proportion (86 %) of the fish captured were lake whitefish.

The Blackwater (mid-Parsnip Reach site) location nets captured only 70 fish. Of special note is the large number of rainbow trout (58) captured, more than double the number captured at any other location (Table 1, Figure 5). The nets were observed prior to retrieval and found not to be tangled.

Heather Point (southern most Parsnip Reach site) nets were set under calm conditions, and pulled under calm conditions. No panels were twisted or tangled with debris. Only 32 fish were captured, the second lowest of all sites.

Table 2. Mean lengths, weights, and condition of fish for pooled 2000 netting data.

Species	# Fish Sampled	Mean Length (mm)	Range (mm)	SD	Mean Weight (g)	Range (grams)	SD	Mean K
Lake Whitefish	139	252.0	148-297	30.4	184.9	34.4-311	57.3	1.11
Kokanee	47	230.2	128-292	44.1	169.2	21.8-333.6	83.4	1.25
Rainbow trout	91	282.2	117-404	53.0	272.2	40.1-639.2	125.4	1.14
Peamouth Chub	84	188.7	122-217	21.3	80.5	22.7-117.8	20.7	1.15
Bull trout	6	419.7	155-669	172.5	1,109.3	35.8-3,461.7	1364.2	0.93

Sample size is less than catch totals due to sub-sampling.

Data analysis by species *(Note that Alpha (α) 0 .05 was used for all tests).*

Peamouth chub

Forebay and Junction sites were the only sites where peamouth chub lengths and weights could compared statistically; all other sites had small sample sizes and can only be compared by viewing the confidence interval charts (Appendix D).

t-Tests (α 0.05), assuming equal variances indicated that the Forebay sample location had significantly heavier and longer peamouth chub than the Junction site (Appendix F).

Rainbow trout

Single factor ANOVA was used to compare the Forebay, Junction and Blackwater sites (Appendix E). The sites analyzed may also be of limited statistical power due to the Forebay and Junction sites having a lower sample size than the Blackwater site.

Rainbow trout lengths were significantly different among the Forebay, Junction and Blackwater netting sites (ANOVA P-value = 0.000631). HSD Tukey analysis (α 0.05) indicated that the Blackwater fish were significantly longer than the Forebay fish (Appendix F). Rainbow trout weights were also found to be significantly different among the three netting sites (ANOVA P-value = 0.000157). HSD Tukey analysis (α 0.05) indicated that as was the case with length, Blackwater location rainbow trout were significantly heavier (weighed more) than the rainbow trout captured at the Forebay netting location (Appendix F).

Kokanee

Analysis of variance (α 0.05) indicated that there were no significant differences between samples site for either lengths (P-value = 0.67) or weights (P-value = 0.73) of kokanee (Appendix E). This analysis should be viewed with caution (Appendix D) due to small sample size between all sites, and may not represent the population as a whole.

Lake whitefish

Single factor ANOVA (Appendix E) was applied to Factor Ross, Forebay, Finlay and Teare Creek sample sites captured fish data. Other sites did not have a sufficient sample size (not enough fish were captured) to ensure that the power of analysis would provide reliable results.

For lake whitefish, single factor ANOVA (α 0.05) indicated that there was a significant difference between sample sites for both length (P-value < 0.001) and weight (P-value < 0.001). HSD Tukey analysis (α 0.05) indicates that for length, the Factor Ross lake whitefish were significantly longer than the Junction and Forebay lake whitefish, while the Teare Creek whitefish were significantly longer than the Junction lake whitefish sample. For sample weights of lake whitefish, HSD Tukey analysis (α 0.05) indicates that Factor Ross lake whitefish were significantly heavier than the Junction and Forebay lake whitefish, while the Teare Creek fish were significantly heavier than the Junction site lake whitefish.

Discussion

An important factor limiting the ability to compare past results with previous studies is that netting sites and methodologies completed by Blackman in 1988 are not consistent with the 2000 assessments. Sampling completed in 1988 consisted of a variety of netting techniques, of which most were concentrated in the littoral zones. Methods used by Barrett and Halsey in 1974-75 were spread over a longer sample season, and over a variety of depths. Therefore, the results discussed can not be viewed as a vigorous comparison with past study's results.

The objective of this report is to provide the collaborative information required for the analysis of the hydroacoustic and trawl results, which will provide a detailed analysis of Williston Reservoir pelagic fish populations. On site discussions with the crew members completing the hydroacoustics and trawl surveys indicated that the floating gillnet sampling generally caught more fish than the trawl. This may be attributed to the fact that passive methods are less intrusive, cover habitat that may not be attainable by the trawl methods, and occur over a wider period of time, which may benefit the catch of certain species over others. Additionally, panels of net loaded with fish may attract piscivores such as bull trout. Bull trout were caught in nets beside kokanee or whitefish, and some of the kokanee and whitefish where partially mutilated. A large component of mutilated fish at the net surface were attributed to sea gulls picking the net; every sampling location that had good numbers of fish, attracted seagulls.

A possible explanation for low bull trout numbers may be linked to adfluvial bull trout ascending natal streams during late July through August to spawn in September. With the exception of one juvenile bull trout caught at the Forebay sample site, there was an absence of juvenile bull trout caught in the gill nets, suggesting that stream residence and littoral zones may be their key habitat. There may also be a tendency for bull trout to inhabit cooler waters located at greater depths than what the netting program was designed to sample. Key forage species such as mature kokanee and whitefish may not be present in the pelagic zones due to their autumn spawning behavior, which may also lead to lower catches of bull trout in pelagic zones. Chisholm et al. (1989) as cited by Mcphail and Baxter 1996 has shown that the average catch over nine years of data ranged from 0.0 - 0.2 bull trout per floating net and 0.8-2.2 bull trout per sinking net.

Forebay, Junction and Teare Creek produced the highest catch per unit effort (Table 1) for which an explanation has yet to be determined. Intensive sampling of reservoir limnology occurring in this area may provide some insight as to fish abundance. The Blackwater sampling location produced the highest number of rainbow trout, which may be attributable to shallower depths, warmer waters, and enrichment that is occurring in the form of nitrogen and organic carbon discharged at the town of Mackenzie from municipal sewage and pulp mill treatment plants; this too may be supported to by the limnology results.

Length and weight frequency histograms (Appendix C) suggest that most samples were not normally distributed, indicating that greater sampling effort may have been required. The presence of weak bi-modal distributions from the histograms may also suggest that samples from each location may not have been sufficient, or that age composition or abundance of species, or habitat usage around the reservoir varies greatly. Again, an increase in sampling effort may provide greater resolution in the data. Inclusion of results from trawl and hydroacoutic surveys may remove discrepancies and improve the results.

To increase efficiency of gillnets on Williston Reservoir in future assessments it is suggested that sinking experimental gillnets be used in conjunction with the system used during this assessment. Sinking nets set just below the surface should reduce the amount of debris catching in the nets and limit attraction and scavenging by gulls. The additional weight of a heavier lead line would reduce net entanglement caused by loading of nets by neutrally buoyant fish, and prevent lead lines surfacing while pulling nets in rough water. It would also be beneficial if a consistent standardized approach to gillnetting is adopted for all future surveys, to ensure replication of methods and valid comparisons, thereby facilitating detection of changes in species assemblage and population dynamics.

Acknowledgements

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Final acknowledgement goes to Mr. Peter Kylo (proprietor of Finlay Bay Resort) for his knowledge of the reservoir, safe and reliable jet-boat services, and assistance with sample collection during the gillnetting exercises.

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APPENDIX A

Fish sample data

A key to abbreviations (Resource Inventory Commission standards) contained within Appendix A

Species
LW- lake whitefish
KO- kokanee
RB- rainbow trout
PCC- peamouth chub
BT- bull trout

Sex
F- female
M- male
U- undetermined

Maturity
IMM- immature
MTC- maturing
M- mature
ST- spent
U- undetermined

Ageing method
SC- scale
OT- otolith

Sample Location				Time In	Time Out	UTM			Depth (m)
Forebay (Williston)Net Site # 1			Net 1	1325	1325	10V. 0547659.6213697			133
Dates	Aug 24- 25/00		Net 2	1400	1405	10V. 0547266.6213853			137
Crew	RP/RZ		Net 3	1415	1435	10V. 0546917.6214067			140

Species	Net #/ Fish #	Length (mm)	Weight (g)	Sex	Maturity	Age	Ageing Method	Vial or Scale #	K
LW	1-1	295	265.0	F	MTC	9	OT	1	1.03
LW	1-2	266	231.3	M	M	6	OT	2	1.23
LW	1-3	263	211.3	M	M	5	OT	3	1.16
LW	1-4		104.1	U	IMM	3	OT	4	1.05
LW	1-5	225	131.2	M	MTC	3	OT	5	1.15
LW	1-6	208	106.1	M	MTC	3	OT	6	1.18
LW	1-7	240	149.1	M	MTC	5	OT	7	1.08
LW	1-8	243	156.9	M	MTC	4	OT	8	1.09
LW	1-9	221	116.5	M	MTC	3	OT	9	1.08
LW	1-10	280	215.4	F	MTC	9	OT	10	0.98
LW	1-11	200	99.8	M	MTC	3	OT	11	1.25
LW	1-12	215	117.2	U	IMM		nil	nil	1.18
LW	1-13	217	109.2	U	IMM		nil	nil	1.07
LW	1-14	215	109.8	U	IMM		nil	nil	1.10
LW	2-15	265	209.7	M	MTC	5	OT	12	1.13
LW	2-16	225	125.7	U	IMM		nil	nil	1.10
LW	2-17	245	162.4	U	IMM		nil	nil	1.10
LW	2-18	255	183.5	F	MTC		nil	nil	1.11
LW	2-19	266	202.2	M	M		nil	nil	1.07
LW	2-20	283	265.1	F	M	9	OT	13	1.17
LW	2-21	213	103.3	U	?		nil	nil	1.07
LW	2-22	204	101.6	U	IMM	2	OT	14	1.20
LW	2-23	243	155.5	F	MTC		nil	nil	1.08
LW	2-24	265	198.4	F	MTC	6	OT	15	1.07
LW	2-25	240	158.0	F	MTC		nil	nil	1.14
LW	2-26	246	168.2	F	MTC		nil	nil	1.13
LW	2-27	255	193.1	F	MTC		nil	nil	1.16
LW	2-28	256	207.5	M	IMM		nil	nil	1.24
LW	2-29	278	252.1	F	M		nil	nil	1.17
LW	2-30	291	311.0	F	M	6	OT	16	1.26
KO	1-1	281	293.5	M	M	5	SC	1	1.32
KO	1-2	281	256.2	F	M	4	SC	2	1.15
KO	1-3	268	225.8	F	M	4	SC	3	1.17
KO	1-4	235	166.6	M	MTC	4	SC	4	1.28
KO	1-5	128	21.8	U	IMM	2	SC	5	1.04
KO	1-6	165	52.6	U	IMM	2	SC	6	1.17
KO	2-7	290	261.5	M	MTC	4	SC	7	1.07
KO	2-8	145	37.9	U	IMM	2	SC	8	1.24
KO	2-9	285	271.2	M	M	5	SC	9	1.17
KO	3-10	225	140.6	U	IMM	3	SC	10	1.23
KO	3-11	227	135.0	F	MTC	4	SC	11	1.15
KO	3-12	149	40.1	U	IMM	2	SC	12	1.21
KO	3-13	155	43.7	U	IMM	2	SC	13	1.17

Site # 1 Species	Net #/ Fish #	Length (mm)	Weight (g)	Sex	Maturity	Age	Ageing Method	Vial or Scale #	K
RB	1-1	324	385.5	M	MTC				1.13
RB	1-2	258	179.1	F	MTC				1.04
RB	1-3	231	149.5	F	IMM				1.21
RB	2-4	260	220.2	F	MTC				1.25
RB	2-5	202	97.2	F	IMM				1.18
RB	2-6	254	200.9	F	MTC				1.23
RB	2-7	257	186.4	F	MTC				1.10
RB	2-8	280	241.2	F	MTC				1.10
RB	2-9	282	274.8	F	ST				1.23
RB	2-10	275	240.0	F	MTC				1.15
RB	2-11	341	453.3	U	IMM				1.14
RB	2-12	223	147.0	F	IMM				1.33
RB	2-13	211	102.5	F	IMM				1.09
RB	3-14	225	142.8	F	IMM				1.25
RB	3-15	249	164.8	U	IMM				1.07
RB	3-16	260	207.5	U	IMM				1.18
RB	3-17	285	249.3	M	IMM				1.08
RB	3-18	257	191.7	F	IMM				1.13
RB	3-19	225	140.6	U	IMM				1.23
RB	3-20	227	135.0	F	MTC				1.15
RB	3-21	149	40.1	U	IMM				1.21
RB	3-22	155	43.7	U	IMM				1.17
PCC	1-1	208	103.6						1.15
PCC	1-2	205	99.0						1.15
PCC	1-3	204	101.5						1.20
PCC	1-4	199	94.4						1.20
PCC	1-5	200	99.9						1.25
PCC	1-6	189	85.0						1.26
PCC	1-7	200	93.6						1.17
PCC	1-8	172	57.1						1.12
PCC	1-9	205	93.5						1.09
PCC	1-10	194	82.3						1.13
PCC	1-11	196	89.6						1.19
PCC	1-12	213	109.8						1.14
PCC	1-13	196	94.4						1.25
PCC	1-14	195	80.7						1.09
PCC	1-15	204	101.0						1.19
PCC	1-16	205	98.0						1.14
PCC	1-17	195	90.7						1.22
PCC	1-18	191	80.4						1.15
PCC	1-19	208	98.6						1.10
PCC	1-20	188	76.1						1.15
PCC	1-21	195	85.9						1.16
PCC	1-22	212	117.8						1.24
PCC	1-23	200	94.7						1.18
PCC	1-24	203	96.5						1.15
PCC	1-25	192	73.1						1.03
PCC	1-26	217	111.6						1.09
PCC	1-27	190	84.3						1.23
PCC	1-28	205	105.7						1.23
PCC	1-29	193	81.1						1.13
PCC	1-30	196	87.8						1.17
PCC	2-31								
BT	1-1	155	35.8	U	IMM	2	OT	70	0.96

Sample Location			Time In	Time Out	UTM		Depth(m)
Clearwater Net Site # 2		Net 1	1040	1030	10U. 0486300.6204218		100
Dates	Aug 26- 27/00	Net 2	1054	1000	10U. 0486912.6204230		110
Crew	RP/KN	Net 3	1120	930	10U. 0487097.6204172		105

Species	Net #/ Fish #	Length (mm)	Weight (g)	Sex	Maturity	Age	Ageing Method	Vial or Scale #	K
LW	1-1	288	262.2	F	MTC	6	OT	17	1.10
KO	1-1	262	226.2	M	M	4	SC	14	1.26
KO	1-2	268	213.8	F	M	4	SC	15	1.11
KO	1-3	199	102.7	M	MTC	3	SC	16	1.30
KO	1-4	246	171.7	F	M	3	SC	17	1.15
KO	2-5	235	191.1	M	MTC	4	SC	18	1.47
RB	1-1	325	396	F	MTC				1.15
RB	1-2	297	268.3	F	MTC				1.02
RB	1-3	162	50.3	F	IMM				1.18
RB	2-4	290	266.5	F	MTC				1.09
RB	2-5	385	542.5	F	MTC				0.95
RB	2-6	363	470.2	M	MTC				0.98
RB	3-7	404	639.2	F	M				0.97
RB	3-8	327	379.2	F	MTC				1.08
RB	3-9	330	399.3	F	MTC				1.11
PCC	1-1	201	89						1.10
PCC	1-2	195	86.1						1.16
PCC	1-3	211	96.4						1.03
PCC	1-4	184	72.1						1.16
PCC	1-5	202	96.2						1.17

Sample Location			Time In	Time Out	UTM		Depth(m)
JUNCTION (Williston)Net Site # 3		Net 1	1420	1244	10U. 0441098.6204745		77
Dates	Aug 27- 28/00	Net 2	1445	1325	10U. 0441250.6204523		60
Crew	RP/KN	Net 3	1710	1340	10U. 0441222.6204708		76

Species	Net #/ Fish #	Length (mm)	Weight (g)	Sex	Maturity	Age	Ageing Method	Vial or Scale #	K
LW	1-1	262	200.2	M	MTC	7	OT	18	1.11
LW	1-2	243	162.8	F	MTC	5	OT	19	1.13
LW	1-3	244	161.4	M	MTC	6	OT	20	1.11
LW	1-4	279	244.3	F	MTC	6	OT	21	1.12
LW	1-5	229	121.7	F	MTC	4	OT	22	1.01
LW	1-6	245	162.6	M	MTC	5	OT	23	1.11
LW	1-7	270	222.6	F	MTC	5	OT	24	1.13
LW	1-8	285	251.7	F	MTC	8	OT	25	1.09
LW	1-9	260	188.3	M	MTC	7	OT	26	1.07
LW	1-10	278	235.1	F	MTC	8	OT	27	1.09
LW	1-11	200	86.7	M	IMM	4	OT	28	1.08
LW	1-12	256	172.5	F	IMM				1.03
LW	1-13	224	113.2	M	IMM	4	OT	29	1.01
LW	1-14	257	187.6	F	IMM				1.11
LW	1-15	240	153.2	F	IMM				1.11
LW	2-16	285	250.5	M	MTC				1.08
LW	2-17	279	209.7	F	MTC				0.97
LW	2-18	270	220.1	M	MTC				1.12
LW	2-19	260	190.2	F	MTC				1.08
LW	2-20	256	180.2	M	MTC				1.07
LW	2-21	259	195.3	M	MTC				1.12
LW	2-22	280	198.3	F	MTC				0.90
LW	2-23	196	76.6	F	IMM	2	OT	30	1.02
LW	2-24	264	194.3	F	MTC				1.06
LW	2-25	203	97.4	F	IMM	3	OT	31	1.16
LW	2-26	222	116	M	MTC	4	OT	32	1.06
LW	2-27	169	54	F	IMM	2	OT	33	1.12
LW	2-28	200	96.4	M	IMM				1.21
LW	2-29	230	127	F	IMM				1.04
LW	2-30	197	82.1	F	IMM	4	OT	34	1.07
LW	2-31	174	58.3	U	IMM	3	OT	35	1.11
LW	3-32	185	73.7	U	IMM	3	OT	36	1.16
LW	3-33	148	34.4	U	IMM	2	OT	37	1.06
KO	1-1	249	208.9	M	M	3	SC	19	1.35
KO	1-2	290	301.8	F	M	4	SC	20	1.24
KO	1-3	236	163.2	U	IMM	3	SC	21	1.24
KO	2-4	274	263.5	F	M	4	SC	22	1.28
KO	2-5	219	112.8	F	M	3	SC	23	1.07
KO	2-6	275	274.8	M	M	4	SC	24	1.32
KO	2-7	213	125.1	U	IMM	3	SC	25	1.29
KO	2-8	221	141.8	F	MTC	4	SC	26	1.31
KO	2-9	173	58.5	F	MTC	2	SC	27	1.13
KO	3-10	253	201.2	F	M	2	SC	28	1.24
KO	3-11	280	252.3	F	M	5	SC	29	1.15

Sample Location			Time In	Time Out	UTM	Depth(m)
JUNCTION (Williston)Net Site # 3		Net 1	1420	1244	10U. 0441098.6204745	77
Dates	Aug 27- 28/00	Net 2	1445	1325	10U. 0441250.6204523	60
Crew	RP/KN	Net 3	1710	1340	10U. 0441222.6204708	76

Species	Net #/ Fish #	Length (mm)	Weight (g)	Sex	Maturity	Age	Ageing Method	Vial or Scale #	K
RB	1-1	278	226.2	U	IMM				1.05
RB	1-2	344	377.3	F	MTC				0.93
RB	1-3	205	94.4	U	IMM				1.10
RB	2-4	292	242.3	F	MTC				0.97
RB	2-5	304	285.4	M	IMM				1.02
RB	2-6	300	270.3	F	MTC				1.00
RB	2-7	313	282.7	F	SP				0.92
RB	2-8	255	183.2	F	IMM				1.10
RB	2-9	282	229.8	F	MTC				1.02
RB	2-10	198	88.7	F	IMM				1.14
RB	2-11	320	341.3	F	MTC				1.04
RB	2-12	330	350.6	F	MTC				0.98
RB	2-13	259	202	F	MTC				1.16
RB	2-14	274	465.2	F	SP				2.26
RB	2-15	191	79.6	F	IMM				1.14
RB	2-16	287	264.9	F	MTC				1.12
RB	3-17	333	413.5	F	MTC				1.12
RB	3-18	296	265.9	M	IMM				1.03
RB	3-19	277	213.8	M	IMM				1.01
PCC	1-1	192	80.1						1.13
PCC	1-2	165	50.5						1.12
PCC	2-3	197	83						1.09
PCC	2-4	184	68.2						1.09
PCC	2-5	185	70.7						1.12
PCC	2-6	189	81.1						1.20
PCC	2-7	193	80.9						1.13
PCC	2-8	202	93						1.13
PCC	2-9	192	83.6						1.18
PCC	2-10	193	82.8						1.15
PCC	2-11	192	79.7						1.13
PCC	2-12	185	74.6						1.18
PCC	2-13	190	74.6						1.09
PCC	2-14	180	67.9						1.16
PCC	2-15	195	86.5						1.17
PCC	2-16	132	26.8						1.17
PCC	2-17	195	88.9						1.20
PCC	2-18	125	22.7						1.16
PCC	3-19	185	76.6						1.21
PCC	3-20	195	86.1						1.16
PCC	3-21	197	80						1.05
PCC	3-22	194	85.6						1.17
PCC	3-23	198	74.7						0.96
PCC	3-24	193	80.3						1.12
PCC	3-25	202	86.2						1.05
PCC	3-26	208	95.5						1.06

Sample Location			Time In	Time Out	UTM		Depth(m)
TEARE CRK (Williston)Net Site # 4		Net 1	1645	1050	10V. 0409708.6251972		70
Dates	Aug 30- 31/00	Net 2	1700	1106	10V. 0409620.6252327		70
Crew	RP/KN	Net 3	1710	1125	10V. 0409508.6252473		70

Species	Net #/ Fish #	Length (mm)	Weight (g)	Sex	Maturity	Age	Ageing Method	Vial or Scale #	K
LW	1-1	294	284.0	F	MTC				1.12
LW	1-2	270	194.4	F	MTC				0.99
LW	1-3	283	248.7	F	MTC				1.10
LW	1-4	269	207.9	M	MTC				1.07
LW	1-5	275	202.6	F	MTC				0.97
LW	1-6	270	204.9	M	MTC				1.04
LW	1-7	275	217.2	M	MTC				1.04
LW	1-8	274	199.1	M	MTC				0.97
LW	1-9	276	243.4	M	MTC				1.16
LW	1-10	245	161.3	M	IMM				1.10
LW	1-11	223	121.6	M	IMM				1.10
LW	1-12	220	114.8	U	IMM				1.08
LW	1-13	268	233.3	F	MTC				1.21
LW	1-14	265	208.3	M	MTC				1.12
LW	1-15	268	221.7	M	MTC				1.15
LW	1-16	252	183.6	F	MTC				1.15
LW	1-17	263	209.6	M	MTC				1.15
LW	1-18	265	198.5	M	MTC				1.07
LW	1-19	276	216.5	M	MTC				1.03
LW	1-20	265	208.1	F	MTC				1.12
LW	1-21	266	213.1	M	MTC				1.13
LW	1-22	230	151.8	U	IMM				1.25
LW	1-23	268	211.4	M	MTC				1.10
LW	1-24	274	244.7	M	MTC				1.19
LW	2-25	265	212.8	M	MTC				1.14
LW	2-26	270	196.4	F	MTC				1.00
LW	2-27	215	116.9	F	IMM	3	OT	41	1.18
LW	2-28	197	83.7	M	IMM	4	OT	42	1.09
LW	2-29	209	97.1	U	IMM	3	OT	43	1.06
LW	3-30	208	104.4	U	IMM	4	OT	44	1.16
KO	1-1	220	145.0	F	MTC	3	SC	36	1.36
KO	1-2	268	252.8	M	MTC	4	SC	37	1.31
KO	1-3	220	130.0	F	MTC	5	SC	38	1.22
KO	2-4	283	302.2	M	M	6	SC	39	1.33
KO	2-5	225	152.9	F	MTC	5	SC	40	1.34
KO	2-6	224	141.6	M	MTC	4	SC	41	1.26
KO	3-7	267	267.4	M	M	6	SC	42	1.40
RB	1-1	334	345.6	F	MTC				0.93
RB	1-2	335	397	F	MTC				1.06
RB	3-3	303	274.5	F	MTC				0.99
PCC	1-1	143	33.1						1.13
PCC	1-2	192	85.6						1.21
PCC	2-3	209	102.3						1.12
PCC	2-4	189	87.7						1.30
PCC	2-5	133	23.1						0.98
PCC	3-6	140	36.1						1.32
PCC	3-7	132	27.6						1.20
BT	1-1	395	546.5	F	MTC	8	OT	65	0.89
BT	1-2	531	1054.8	F	MTC	9	OT	64	0.70

Sample Location			Time In	Time Out	UTM		Depth(m)
FACTOR ROSS (Williston)Net Site # 5	Net 1	1230	945	10V. 0396967.6278713		41
Dates Aug 29-30/00	Net 2	1245	1020	10V. 0397069.6278491		47
Crew RP/KN	Net 3	1300	1100	10V. 0397202.6278356		42

Species	Net #/ Fish #	Length (mm)	Weight (g)	Sex	Maturity	Age	Ageing Method	Vial or Scale #	K
LW	1-1	281	243.8	F	MTC	7	OT	38	1.10
LW	1-2	274	240.0	M	MTC	10	OT	39	1.17
LW	1-3	259	219.2	F	MTC	7	OT	40	1.26
LW	1-4	283	242.1	F	MTC				1.07
LW	1-5	273	217.1	M	MTC				1.07
LW	1-6	270	224.0	F	MTC				1.14
LW	1-7	249	191.4	M	MTC				1.24
LW	1-8	271	224.5	F	MTC				1.13
LW	1-9	263	191.8	F	MTC				1.05
LW	1-10	266	209.2	F	MTC				1.11
LW	1-11	263	227.8	M	MTC				1.25
LW	1-12	272	235.5	F	MTC				1.17
LW	1-13	274	224.5	F	MTC				1.09
LW	1-14	263	223.4	F	MTC				1.23
LW	1-15	262	221.2	M	MTC				1.23
LW	1-16	271	231.4	F	MTC				1.16
LW	1-17	268	214.8	F	MTC				1.12
LW	1-18	282	233.5	F	MTC				1.04
LW	1-19	263	199.6	F	MTC				1.10
LW	1-20	280	259.9	F	MTC				1.18
LW	2-21	271	257.6	F	MTC				1.29
LW	2-22	297	286.6	M	MTC				1.09
LW	2-23	256	193.3	F	MTC				1.15
LW	2-24	261	220.0	M	MTC				1.24
LW	2-25	272	227.1	F	MTC				1.13
LW	2-26	240	153.8	M	MTC				1.11
LW	2-27	281	216.8	M	MTC				0.98
LW	2-28	269	223.0	F	MTC				1.15
LW	2-29	280	227.4	F	MTC				1.04
LW	2-30	270	207.2	F	MTC				1.05
KO	1-1	259	227.9	F	M	5	SC	30	1.31
KO	1-2	218	145.5	M	MTC	3	SC	31	1.40
KO	1-3	218	142.4	M	MTC	3	SC	32	1.37
KO	1-4	161	59.0	M	MTC	2	SC	33	1.41
KO	2-5	292	333.6	M	M	5	SC	34	1.34
KO	2-6	222	142.8	M	MTC	3	SC	35	1.31
RB	1-1	263	198.5	F	MTC				1.09
RB	2-2	215	112.4	F	IMM				1.13
RB	2-3	300	282.8	F	MTC				1.05
RB	2-4	249	175.9	U	IMM				1.14
RB	3-5	234	137.0	M	MTC				1.07
PCC	1-1	138	32.0						1.22
PCC	1-2	198	97.7						1.26
PCC	2-3	196	94.7						1.26
PCC	2-4	137	32.1						1.25
PCC	3-5	202	94.0						1.14
PCC	3-6	122	54.7						3.01

Sample Location				Time In	Time Out	UTM			Depth(m)
Blackwater (Williston)Net Site # 6			Net 1	1245	1118	10U. 0457697.6175978			65
Dates	Sept1-2/00		Net 2	1300	1050	10U. 0457712.6175755			65
Crew	RP/KN		Net 3	1320	1007	10U. 0457709.6175573			65
Species	**Net #/ Fish #**	**Length (mm)**	**Weight (g)**	**Sex**	**Maturity**	**Age**	**Ageing Method**	**Vial or Scale #**	**K**
LW	1-1	281	230.0	F	MTC				1.04
LW	1-2	271	254.8	F	MTC				1.28
LW	1-3	260	201.7	F	MTC				1.15
LW	2-4	272	232.0	M	MTC				1.15
LW	2-5	264	210.3	F	MTC				1.14
LW	3-6	261	208.4	F	MTC				1.17
LW	3-7	278	222.9	F	IMM				1.04
KO	1-1	176	63.7	F	IMM	2	SC	43	1.17
KO	2-2	248	195.0	M	IMM	5	SC	44	1.28
KO	2-3	227	145.5	U	IMM	4	SC	45	1.24
RB	1-1	326	392.1	F	MTC				1.13
RB	1-2	336	415.0	M	MTC				1.09
RB	1-3	287	289.7	F	MTC				1.23
RB	1-4	226	128.0	U	IMM				1.11
RB	1-5	311	351.3	F	MTC				1.17
RB	1-6	231	141.2	F	IMM				1.15
RB	1-7	298	292.3	M	IMM				1.10
RB	1-8	321	411.0	F	MTC				1.24
RB	1-9	299	282.3	F	MTC				1.06
RB	1-10	311	307.2	F	MTC				1.02
RB	1-11	350	480.6	M	MTC				1.12
RB	1-12	336	399.9	M	MTC				1.05
RB	1-13	372	549.1	M	MTC				1.07
RB	1-14	286	236.6	M	MTC				1.01
RB	1-15	318	324.9	F	ST				1.01
RB	1-16	323	456.7	M	MTC				1.36
RB	1-17	286	266.9	F	MTC				1.14
RB	1-18	309	316.4	U	IMM				1.07
RB	1-19	324	382.1	M	MTC				1.12
RB	1-20	226	129.4	F	IMM				1.12
RB	1-21	117	52.3	F	IMM				3.27
RB	2-22	297	301.0	F	MTC				1.15
RB	2-23	343	454.6	M	MTC				1.13
RB	2-24	319	362.5	M	MTC				1.12
RB	2-25	289	287.5	F	MTC				1.19
RB	2-26	290	296.1	F	MTC				1.21
RB	2-27	310	320.6	F	MTC				1.08
RB	2-28	313	353.2	F	MTC				1.15
RB	2-29	319	360.3	F	MTC				1.11
RB	2-30	301	295.4	F	MTC				1.08
PCC	1-1	173	59.8						1.15

Sample Location				Time In	Time Out	UTM			Depth(m)
Heather Pt. (Williston)Net Site # 7			Net 1	1355	1005	10U. 0480727.6145365			40
Dates	Sept 2-3 /00		Net 2	1405	945	10U. 0480861.6145238			40
Crew	RP/KN		Net 3	1415	934	10U. 0480911.6145088			40
Species	**Net #/ Fish #**	**Length (mm)**	**Weight (g)**	**Sex**	**Maturity**	**Age**	**Ageing Method**	**Vial #**	**K**
LW	1-1	205	86.4	F	IMM	4	OT	45	1.00
LW	1-2	275	209.8	M	MTC				1.01
LW	1-3	244	166.9	M	IMM				1.15
LW	1-4	269	192.2	M	MTC				0.99
LW	1-5	150	36	U	IMM	2	OT	46	1.07
LW	2-6	264	211.7	M	MTC				1.15
LW	2-7	203	93.8	F	IMM				1.12
LW	3-8	280	240.9	M	MTC				1.10
KO	1-1	182	78.2	U	IMM				1.30
KO	1-2	181	70.1	U	IMM				1.18
RB	1-1	280	247.3	F	MTC				1.13
RB	1-2	318	360.9	M	MTC				1.12
RB	3-3	222	118.7	F	IMM				1.08
BT	1-1	669	3461.75	F	MTC	11	OT	63	1.16
BT	2-2	362	447.6	F	MTC	6	OT	62	0.94
BT	2-3	406	na	U	U	7	OT	61	
PCC	1-1	204	94.4						1.11
PCC	1-2	190	79.4						1.16
PCC	1-3	187	72.3						1.11
PCC	1-4	180	71.2						1.22
PCC	1-5	183	72.1						1.18
PCC	3-6	176	59.8						1.10
PCC	3-7	199	86.6						1.10
PCC	3-8	204	94.1						1.11
PCC	3-9	185	82.8						1.31
PCC	3-10	192	84.1						1.19

APPENDIX B

Gill net catch data
By panel size

Clearwater							
Panels	1	2	3	4	5	6	
Net # 1	25 mm	76mm	51mm	89mm	38mm	64mm	TOTALS
LW	0	0	0	0	0	1	1
KO	0	0	1	0	1	0	2
RB	0	0	2	0	2	1	5
PCC	0	0	0	0	6	0	6
BT	0	0	0	0	0	0	0
Net # 2	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	0	0	0	0	0
KO	0	0	0	0	0	0	0
RB	0	0	0	0	0	0	0
PCC	0	0	0	0	0	0	0
BT	0	0	0	0	0	0	0
Net # 3	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	0	0	0	0	0
KO	0	0	1	0	0	0	1
RB	0	2	0	0	0	1	3
PCC	0	0	0	0	0	0	0
BT	0	0	0	0	0	0	0
TOTALS	**0**	**2**	**4**	**0**	**9**	**3**	18

A discrepancy occurs between sampled numbers(5) of kokanee and those tallied by panel(3), and rainbow sampled (6)

Junction							
Panels	1	2	3	4	5	6	
Net # 1	25 mm	76mm	51mm	89mm	38mm	64mm	TOTALS
LW	0	0	10	0	1	6	17
KO	0	0	2	0	0	1	3
RB	0	0	2	0	1	0	3
PCC	0	0	0	0	3	0	3
BT	0	0	2	0	0	0	2
Net # 2	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	15	0	8	8	31
KO	0	0	4	0	2	0	6
RB	0	1	7	0	6	0	14
PCC	2	0	0	0	14	0	16
BT	0	0	0	0	0	0	0
Net # 3	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	1	0	9	0	3	3	16
KO	0	0	0	0	0	3	3
RB	0	0	4	0	0	0	4
PCC	0	0	0	0	9	0	9
BT	0	0	0	0	0	0	0
TOTALS	**3**	**1**	**55**	**0**	**47**	**21**	127

Teare Crk.							
Panels	1	2	3	4	5	6	
Net # 1	25 mm	76mm	51mm	89mm	38mm	64mm	TOTALS
LW	0	0	16	0	3	12	31
KO	0	0	3	0	0	0	3
RB	0	0	0	1	0	1	2
PCC	1	0	0	0	1	0	2
BT	0	0	0	1	1	0	2
Net # 2	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	22	0	5	10	37
KO	0	1	0	1	1	0	3
RB	0	0	0	0	0	0	0
PCC	1	0	0	0	2	0	3
BT	0	0	0	0	0	0	0
Net # 3	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	1	22	0	1	22	46
KO	0	0	1	0	0	0	1
RB	0	0	1	0	0	0	1
PCC	2	0	0	0	0	0	2
BT	0	0	0	0	0	0	0
	4	2	65	3	14	55	133

Factor Ross							
Panels	25mm	76mm	51mm	89mm	38mm	64mm	
Net # 1	1	2	3	4	5	6	TOTALS
LW	0	0	9	0	0	13	22
KO	0	0	3	0	1	0	4
RB	0	0	1	0	0	0	1
PCC	1	0	0	0	1	0	2
BT	0	0	0	0	0	0	0
	25mm	76mm	51mm	89mm	38mm	64mm	
Net # 2	1	2	3	4	5	6	
LW	0	0	3	8	0	5	16
KO	0	0	1	0	0	1	2
RB	0	0	0	2	1	0	3
PCC	1	0	0	1	2	0	4
BT	0	0	1	0	0	1	2
	25mm	76mm	51mm	89mm	38mm	64mm	
Net # 3	1	2	3	4	5	6	
LW	0	0	9	0	0	7	16
KO	0	0	1	0	0	0	1
RB	0	0	1	0	0	0	1
PCC	0	0	0	0	2	0	2
BT	0	0	0	0	0	0	0
TOTALS	2	0	29	11	7	27	76

Blackwater							
Panels	1	2	3	4	5	6	
Net # 1	25 mm	76mm	51mm	89mm	38mm	64mm	TOTALS
LW	0	0	0	2	0	1	3
KO	0	0	0	0	2	0	2
RB	0	0	2	16	3	0	21
PCC	0	0	0	0	1	0	1
BT	0	0	0	0	0	0	0
Net # 2	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	0	1	0	0	1
KO	0	1	0	1	0	0	2
RB	1	3	0	10	6	0	20
PCC	0	0	0	0	0	0	0
BT	0	0	0	0	0	0	0
Net # 3	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	2	0	0	1	3
KO	0	0	0	0	0	0	0
RB	2	1	14	0	0	0	17
PCC	0	0	0	0	0	0	0
BT	0	0	0	0	0	0	0
TOTALS	3	5	18	30	12	2	70

Heather Pt.							
Panels	1	2	3	4	5	6	
Net # 1	25 mm	76mm	51mm	89mm	38mm	64mm	TOTALS
LW	0	0	3	0	1	1	5
KO	0	0	0	0	2	0	2
RB	0	1	1	0	0	0	2
PCC	1	0	0	0	5	0	6
BT	0	0	1	0	0	0	1
Net # 2	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	2	0	0	2	4
KO	0	0	0	0	0	0	0
RB	0	0	1	0	0	0	1
PCC	0	0	0	0	1	0	1
BT	0	1	0	0	0	1	2
Net # 3	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	0	0	0	1	1
KO	0	0	0	0	0	0	0
RB	0	0	0	1	0	0	1
PCC	1	0	0	0	5	0	6
BT	0	0	0	0	0	0	0
TOTALS	2	2	8	1	14	5	32

All gill net sites combined (2000).							
Panels	1	2	3	4	5	6	TOTALS
Net # 1	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	38	2	5	34	**79**
KO	0	0	9	0	6	1	**16**
RB	0	2	8	17	6	2	**35**
PCC	3	0	0	0	17	0	**20**
BT	0	0	3	1	1	0	**5**
Net # 2	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	0	0	42	9	13	25	**89**
KO	0	2	6	2	3	1	**14**
RB	1	4	8	12	13	0	**38**
PCC	4	0	0	1	19	0	**24**
BT	0	2	1	0	0	2	**5**
Net # 3	25 mm	76mm	51mm	89mm	38mm	64mm	
LW	1	1	42	0	4	34	**82**
KO	0	0	2	0	0	3	**5**
RB	2	3	20	1	0	1	**27**
PCC	3	0	0	0	16	0	**19**
BT	0	0	0	0	0	0	**0**
TOTALS	**14**	**14**	**179**	**45**	**103**	**103**	**458**

Does not include fish netted at the Forebay due to counting errors by crew, or discrepancies caused by recorder error

APPENDIX C

Length and weight frequency histograms

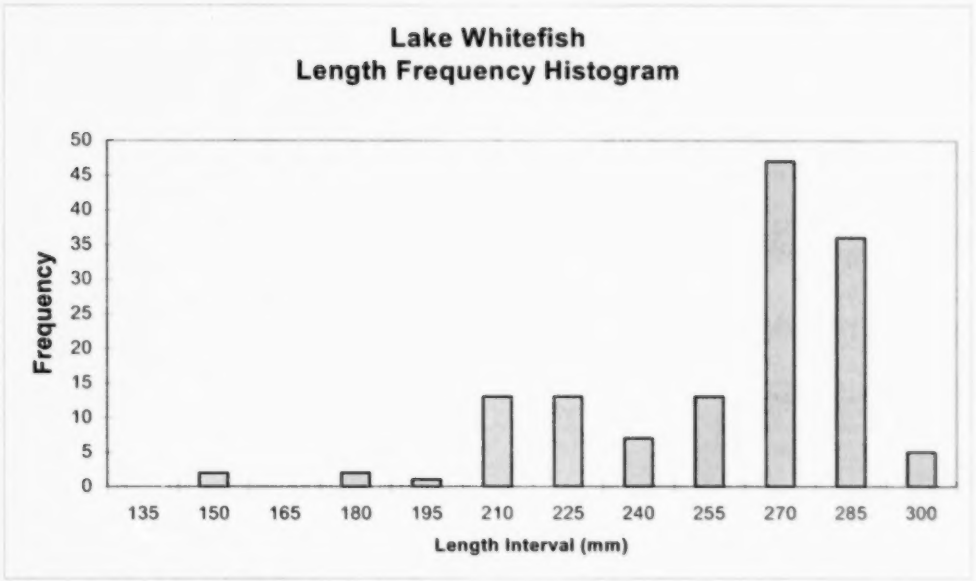


Figure C1. Lake whitefish length frequencies (n= 139).

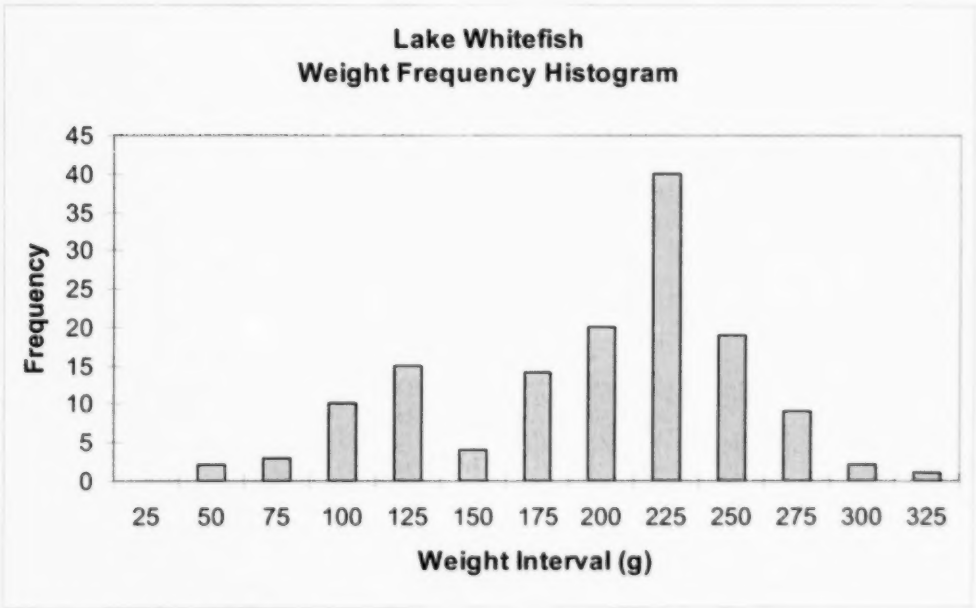


Figure C2. Lake whitefish weight frequencies (n = 139).

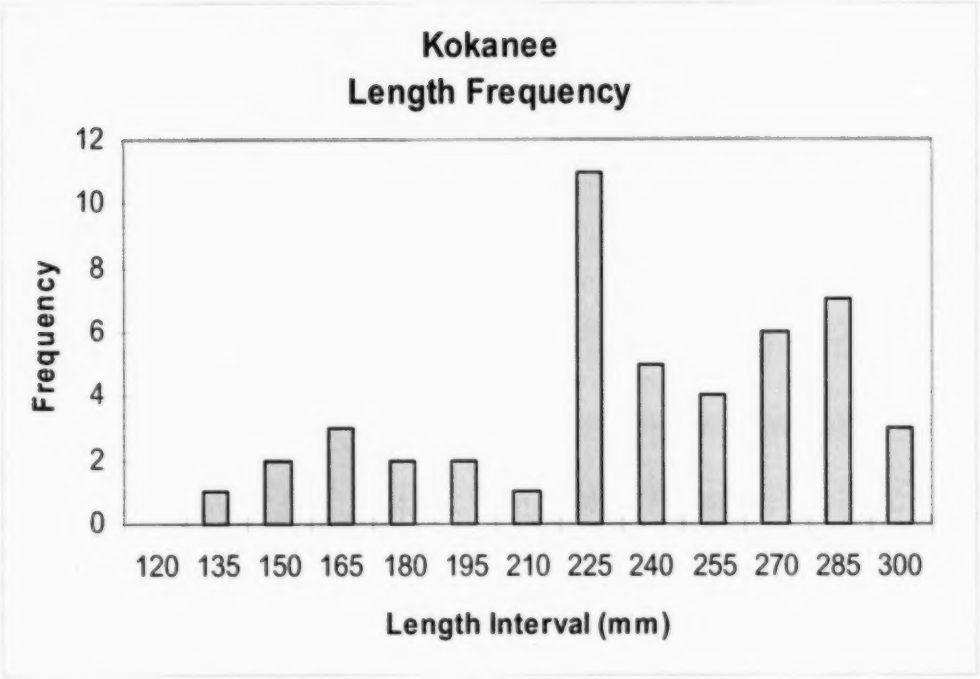


Figure C3. Kokanee length frequencies (n = 47)

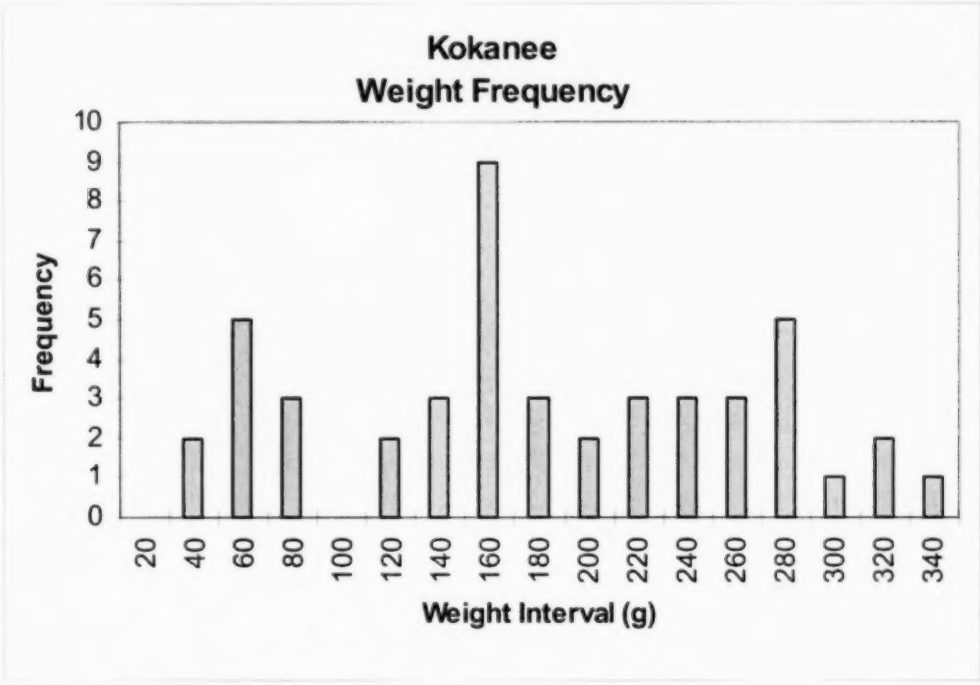


Figure C4. Kokanee weight frequencies (n= 47).

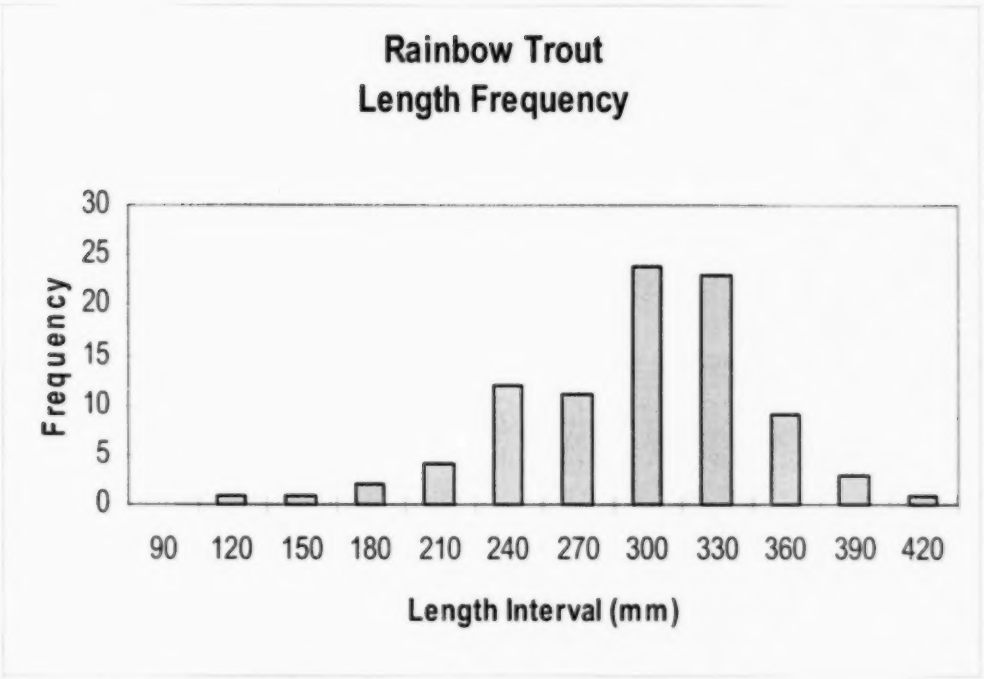


Figure C5. Rainbow trout length frequencies (n= 91).

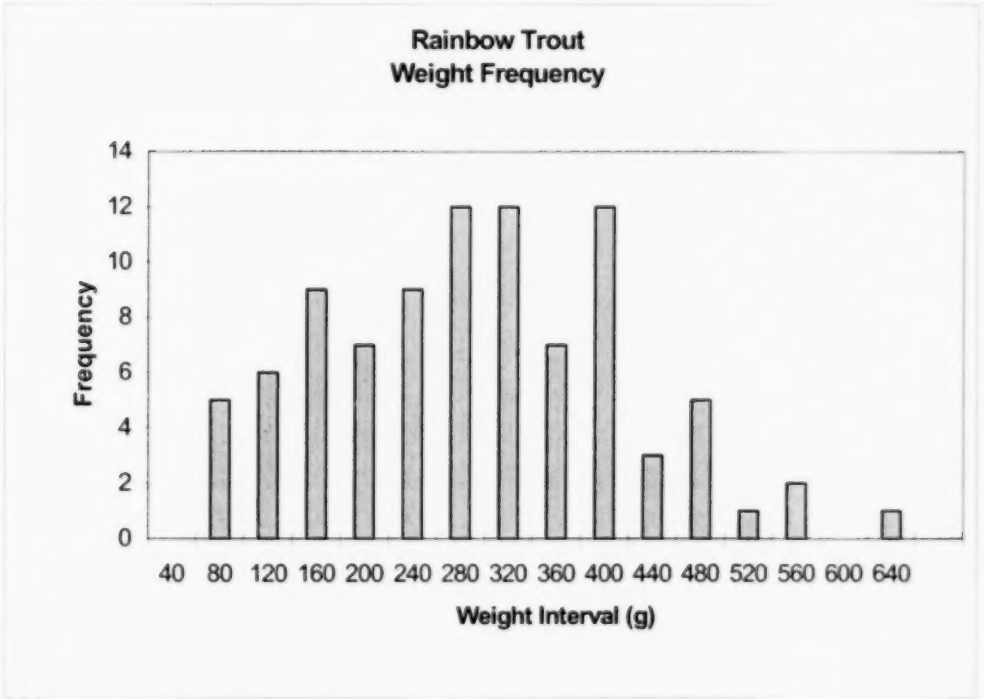


Figure C6. Rainbow trout weight frequencies (n= 91).

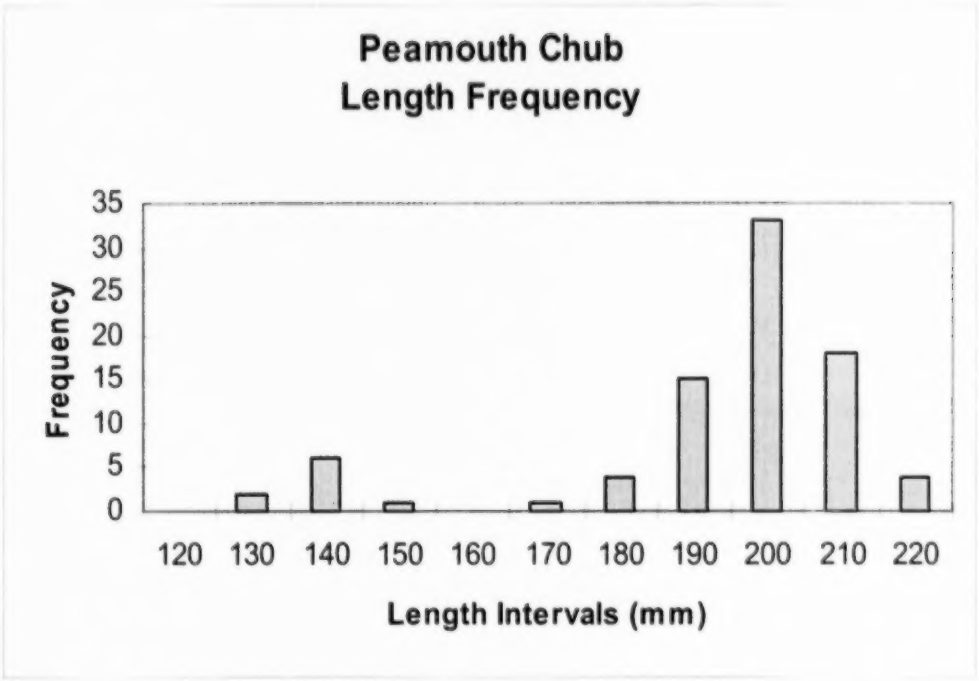


Figure C7. Peamouth chub length frequencies (n = 84).

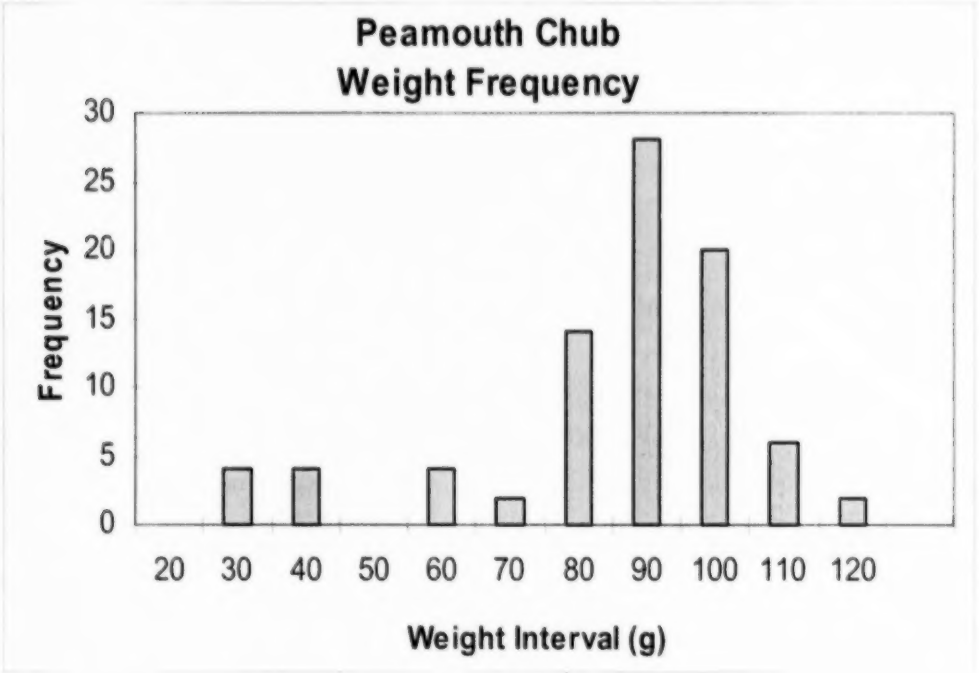
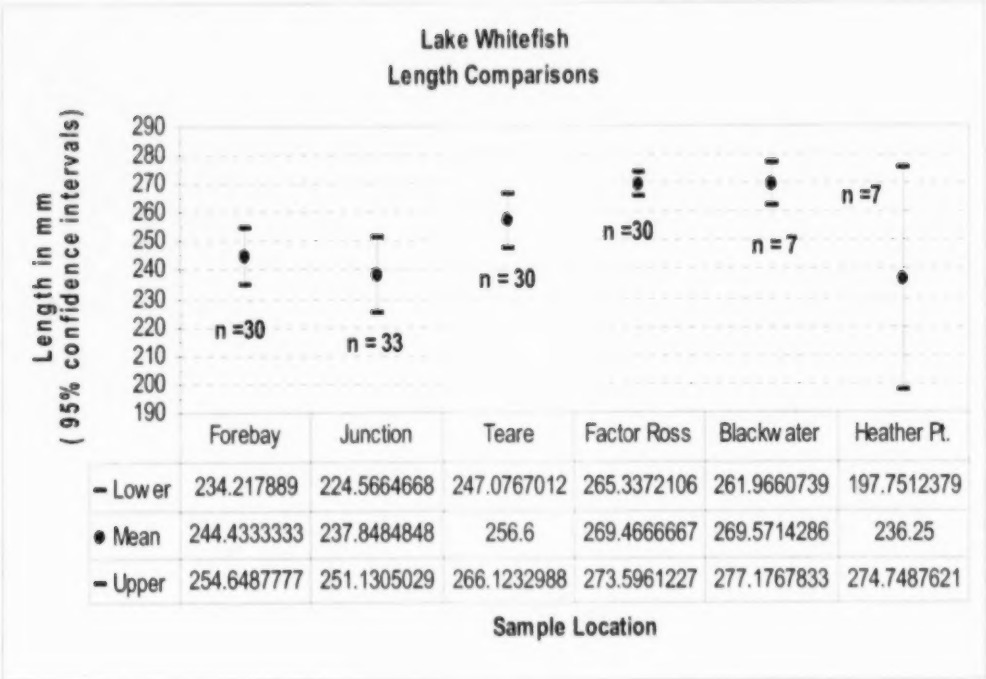
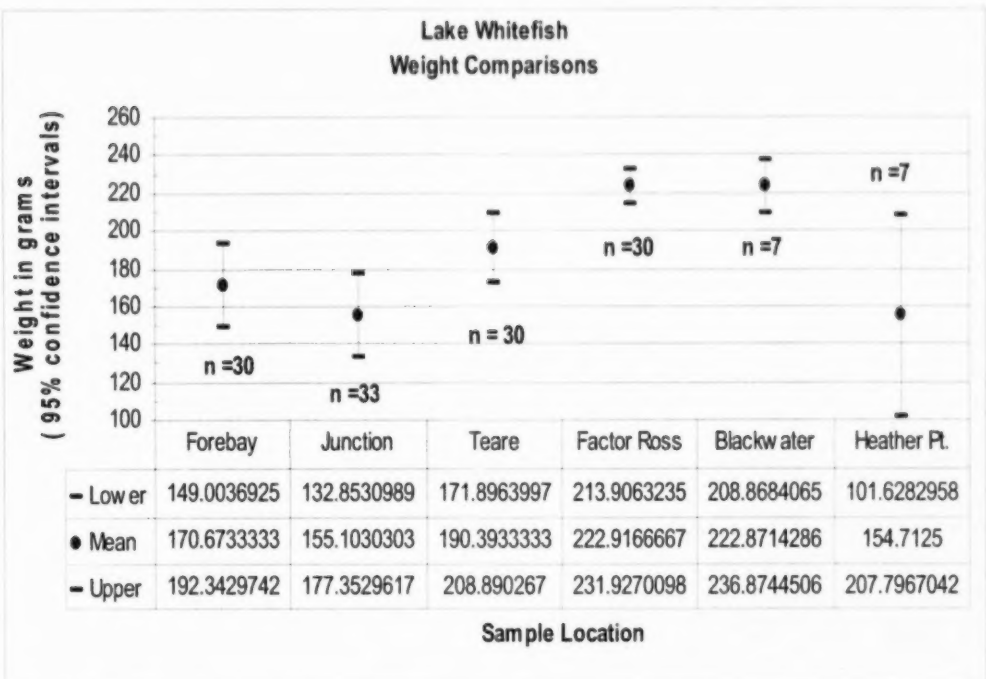


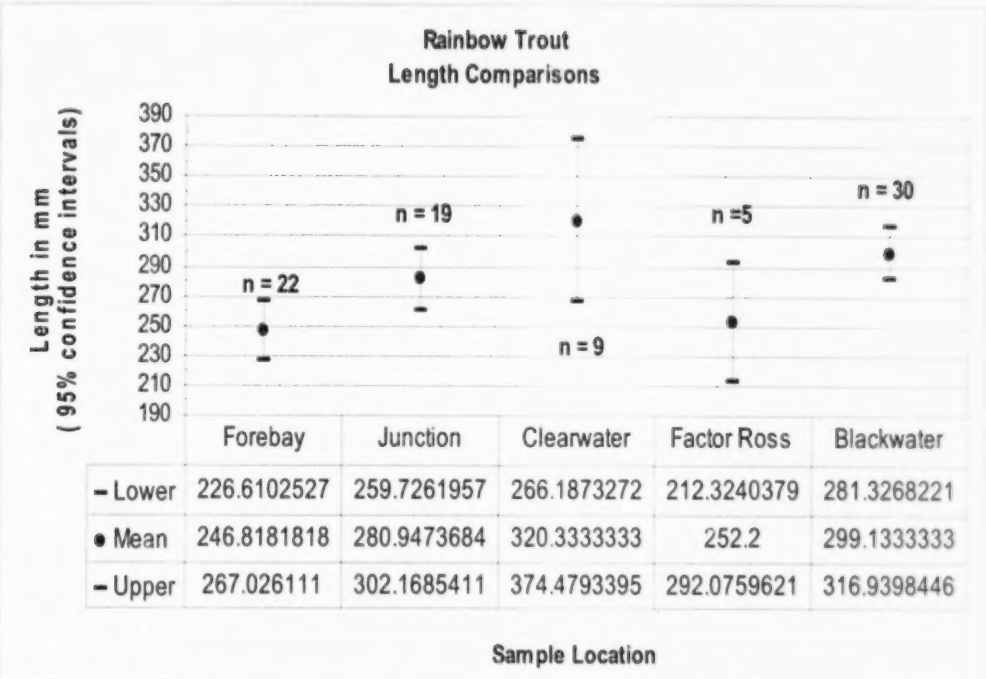
Figure C 8. Peamouth chub weight frequencies (n = 84).

APPENDIX D

Confidence interval (95%) graphics of length and weight

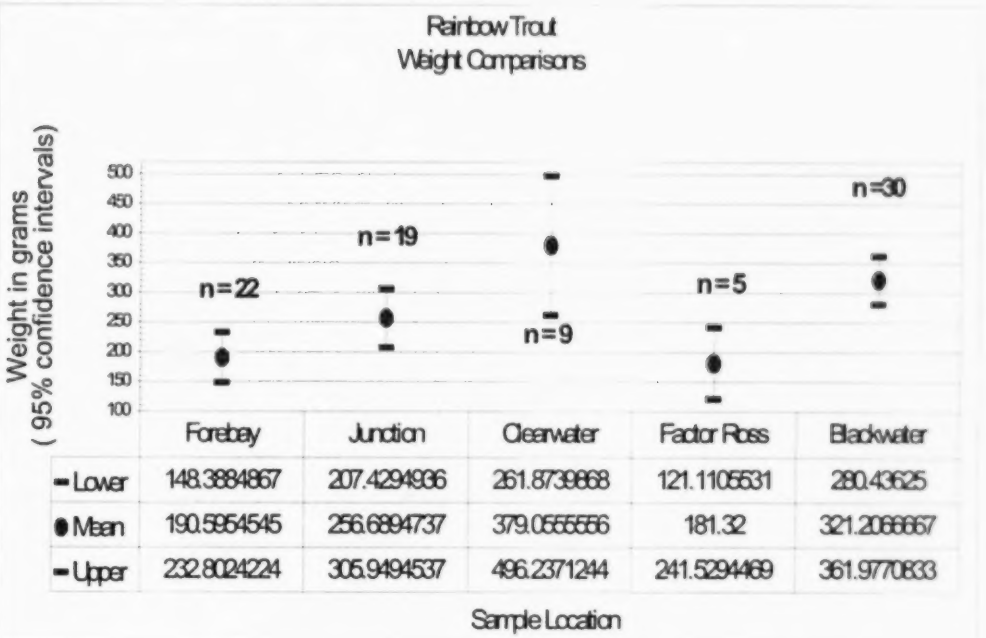

Lake Whitefish
Length Comparisons
Length in mm
(95% confidence intervals)
290
280
270
260
250
240
230
220
210
200
190
n =30
n = 33
n = 30
n =30
n = 7
n =7
Forebay
Junction
Teare
Factor Ross
Blackwater
Heather Pt.
Lower 234.217889 224.5664668 247.0767012 265.3372106 261.9660739 197.7512379
Mean 244.4333333 237.8484848 256.6 269.4666667 269.5714286 236.25
Upper 254.6487777 251.1305029 266.1232988 273.5961227 277.1767833 274.7487621
Sample Location


Lake Whitefish
Weight Comparisons
Weight in grams
(95% confidence intervals)
260
240
220
200
180
160
140
120
100
n =30
n =33
n = 30
n =30
n =7
n =7
Forebay
Junction
Teare
Factor Ross
Blackwater
Heather Pt.
Lower 149.0036925 132.8530989 171.8963997 213.9063235 208.8684065 101.6282958
Mean 170.6733333 155.1030303 190.3933333 222.9166667 222.8714286 154.7125
Upper 192.3429742 177.3529617 208.890267 231.9270098 236.8744506 207.7967042
Sample Location



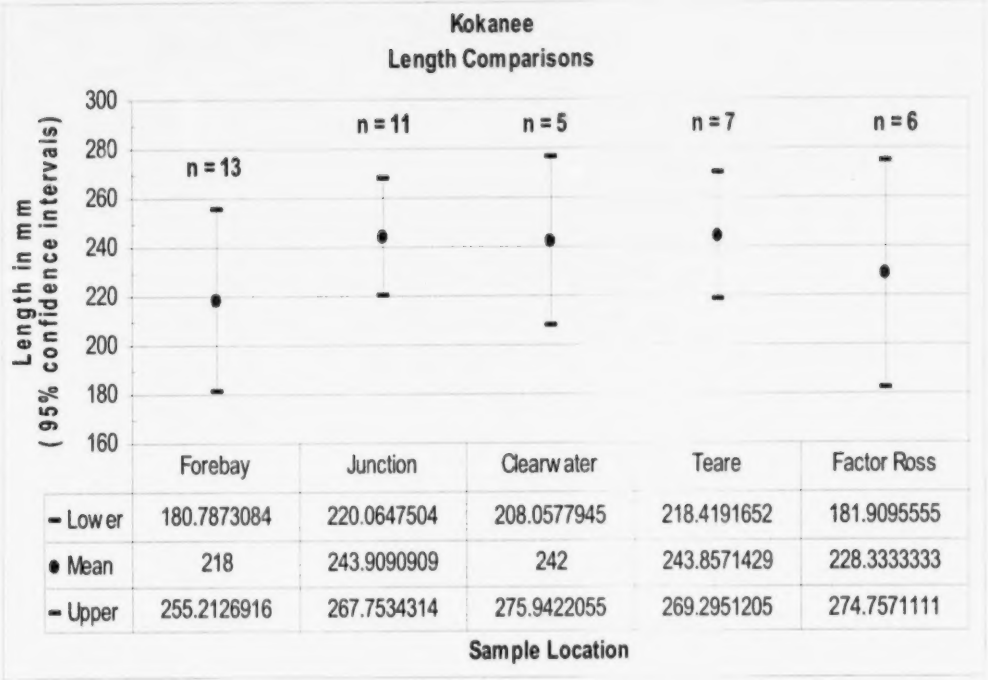
	Forebay	Junction	Clearwater	Factor Ross	Blackwater
– Lower	226.6102527	259.7261957	266.1873272	212.3240379	281.3268221
• Mean	246.8181818	280.9473684	320.3333333	252.2	299.1333333
– Upper	267.026111	302.1685411	374.4793395	292.0759621	316.9398446

Sample Location



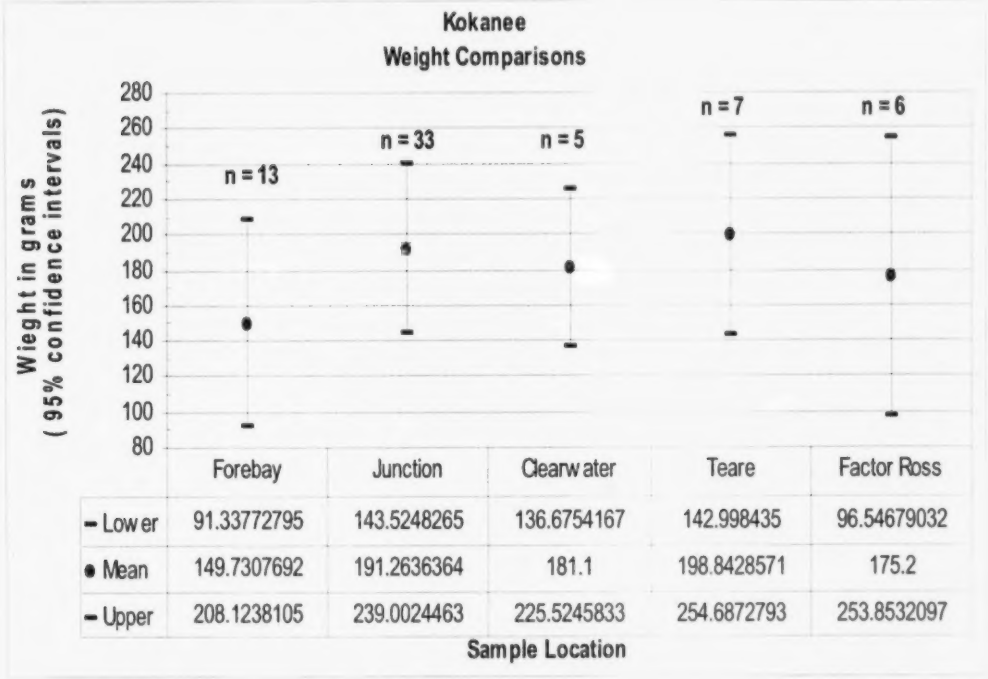
	Forebay	Junction	Clearwater	Factor Ross	Blackwater
– Lower	148.3884867	207.4294936	261.8739868	121.1105531	280.43625
• Mean	190.5954545	256.6894737	379.0555556	181.32	321.2066667
– Upper	232.8024224	305.9494537	496.2371244	241.5294469	361.9770833

Sample Location



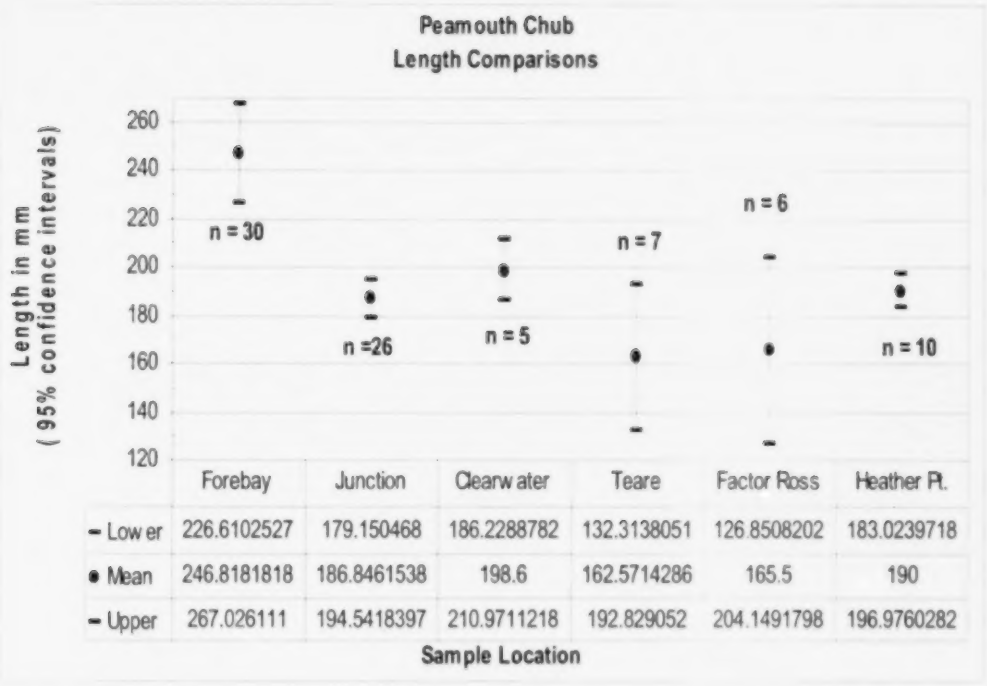
	Forebay	Junction	Clearwater	Teare	Factor Ross
– Lower	180.7873084	220.0647504	208.0577945	218.4191652	181.9095555
• Mean	218	243.9090909	242	243.8571429	228.3333333
– Upper	255.2126916	267.7534314	275.9422055	269.2951205	274.7571111

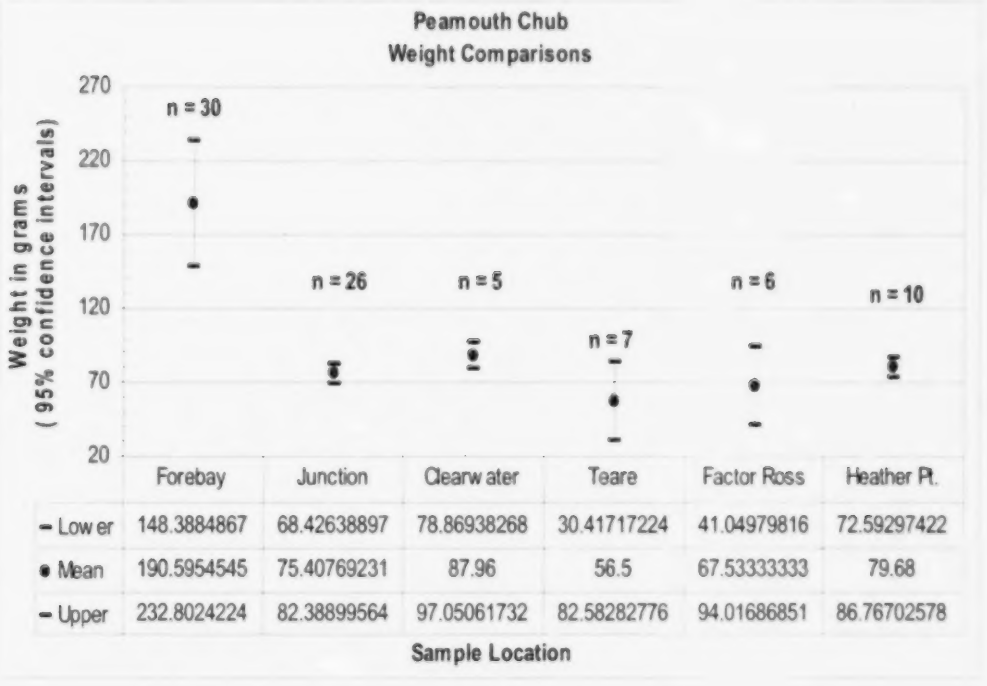
Sample Location



	Forebay	Junction	Clearwater	Teare	Factor Ross
– Lower	91.33772795	143.5248265	136.6754167	142.998435	96.54679032
• Mean	149.7307692	191.2636364	181.1	198.8428571	175.2
– Upper	208.1238105	239.0024463	225.5245833	254.6872793	253.8532097

Sample Location


Peamouth Chub
Length Comparisons
Length in mm
(95% confidence intervals)
260
240
220
200
180
160
140
120
n = 30
n =26
n = 5
n = 7
n = 6
n = 10
Forebay
Junction
Clearwater
Teare
Factor Ross
Heather Pt.
Lower 226.6102527 179.150468 186.2288782 132.3138051 126.8508202 183.0239718
Mean 246.8181818 186.8461538 198.6 162.5714286 165.5 190
Upper 267.026111 194.5418397 210.9711218 192.829052 204.1491798 196.9760282
Sample Location


Peamouth Chub
Weight Comparisons
Weight in grams
(95% confidence intervals)
270
220
170
120
70
20
n = 30
n = 26
n = 5
n = 7
n = 6
n = 10
Forebay
Junction
Clearwater
Teare
Factor Ross
Heather Pt.
Lower 148.3884867 68.42638897 78.86938268 30.41717224 41.04979816 72.59297422
Mean 190.5954545 75.40769231 87.96 56.5 67.53333333 79.68
Upper 232.8024224 82.38899564 97.05061732 82.58282776 94.01686851 86.76702578
Sample Location

APPENDIX E

ANOVA
Result tables

Anova: Single Factor for rainbow trout weights

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Forebay	22	4193.1	190.5954545	9371.397597
Junction	19	4877.1	256.6894737	11024.41211
Blackwater	30	9636.2	321.2066667	11924.08133

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	217714.6018	2	108857.3009	9.989103379	**0.0001572**	3.13167448
Within Groups	741037.1261	68	10897.6048			
Total	958751.7279	70				

Anova: Single Factor for rainbow trout lengths

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Forebay	22	5430	246.8181818	2076.536797
Junction	19	5338	280.9473684	1938.385965
Blackwater	30	8974	299.1333333	2274.533333

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	34954.08789	2	17477.04394	8.226786412	**0.0006314**	3.13167448
Within Groups	144459.6868	68	2124.407158			
Total	179413.7746	70				

Anova: Single Factor for kokanee length

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Forebay	13	2834	218	3791.5
Clearwater	5	1210	242	747.5
Junction	11	2683	243.9090909	1259.890909
Teare	7	1707	243.8571429	756.4761905
Factor Ross	6	1370	228.3333333	1956.266667
Blackwater	3	651	217	1371

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	6342.900433	5	1268.580087	0.63307989	**0.6756258**	2.45582754
Within Groups	78149.09957	39	2003.823066			
Total	84492	44				

Anova: Single Factor for kokanee weights

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Forebay	13	1946.5	149.7307692	10599.34231
Clearwater	5	905.5	181.1	2359.555
Junction	11	2103.9	191.2636364	5994.448545
Teare	7	1391.9	198.8428571	5220.00619
Factor Ross	6	1051.2	175.2	8875.596
Blackwater	3	404.2	134.7333333	4396.863333

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	20125.82215	5	4025.164431	0.558520425	**0.7309718**	2.45582754
Within Groups	281066.557	39	7206.834794			
Total	301192.3791	44				

Anova: Single Factor for lake whitefish weights

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Forebay	30	5120.2	170.6733333	3368.511678
Finlay	33	5118.4	155.1030303	3906.471553
Teare	30	5711.8	190.3933333	2454.336506
Factor Ross	30	6687.5	222.9166667	582.3945402

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	79545.31829	3	26515.1061	10.15351549	**5.26209E-06**	2.680806688
Within Groups	310759.1287	119	2611.42125			
Total	390304.447	122				

Anova: Single Factor for Lake Whitefish lengths

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
F Ross	30	8084	269.4666667	122.3264368
Forebay	30	7333	244.4333333	748.5988506
Finlay	33	7849	237.8484848	1403.007576
Teare	30	7698	256.6	650.5931034

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	18105.39904	3	6035.133013	8.067609569	**6.15183E-05**	2.680806688
Within Groups	89020.27576	119	748.0695442			
Total	107125.6748	122				

APPENDIX F

HSD Tukey
and
t-Test results for peamouth chub

HSD TUKEY Rainbow trout

k	3		
v (error DF)	68		
s^2(error MS within)	10897.6048	weight	2124.407158

	Location	Mean W	Mean L	N
1	Forebay	190.5954	246.8181	22
2	Junction	256.6895	280.9474	19
3	Blackwater	321.2067	299.1333	30

HSD TUKEY for rainbow trout weights (grams)

Comparison	Difference	SE	q	q0.05,df error, k	Conclusion
3 vs. 1	130.6113	20.7195459	6.303772	3.339	significant
3 vs. 2	64.5172	21.6426851	2.981016	3.339	not significant
2 vs. 1	66.0941	23.118216	2.858962	3.339	not significant

HSD TUKEY for rainbow trout lengths (mm)

Comparison	Difference	SE	q	q0.05,df error, k	Conclusion
3 vs. 1	52.3152	9.14815647	5.71866	3.339	significant
3 vs. 2	18.18594	9.55574369	1.903142	3.339	not significant
2 vs. 1	34.12926	10.2072245	3.343638	3.339	not significant

HSD TUKEY lake whitefish

k	4		
v (error DF)	119		
s^2(error MS within)	2611.42125	weight	748.0695442 Length

	Location	Mean W	Mean L	N
1	Factor Ross	222.916667	269.4667	30
2	Teare	190.393333	256.6	33
3	Forebay	170.673333	244.4333	30
4	Junction	155.10303	237.8485	30

HSD TUKEY for lake whitefish weights (grams)

Comparison	Difference	SE	q	q0.05,df error, k	Conclusion
1 vs. 4	67.81363636	9.32991827	7.268406	3.685	significant
1 vs. 3	52.24333333	9.11540872	5.731321	3.685	significant
1 vs. 2	32.52333333	9.32991827	3.485918	3.685	not significant
2 vs. 3	19.72	9.11540872	2.16337	3.685	not significant
2 vs. 4	35.29030303	9.11540872	3.8715	3.685	significant
3 vs. 4	15.57030303	9.32991827	1.668857	3.685	not significant

HSD TUKEY for lake whitefish lengths (mm)

Comparison	Difference	SE	q	q0.05,df error, k	Conclusion
1 vs. 4	31.61818182	4.993561	6.33179	3.685	significant
1 vs. 3	25.03333333	4.993561	5.013123	3.685	significant
1 vs. 2	12.86666667	4.87875115	2.637287	3.685	not significant
2 vs. 3	12.16666667	4.87875115	2.493808	3.685	not significant
2 vs. 4	18.75151515	4.87875115	3.843507	3.685	significant
3 vs. 4	6.584848485	4.993561	1.318668	3.685	not significant

t-Test: Two-Sample Assuming Equal Variances for Peamouth chub					
Lengths			**WEIGHTS**		
	Forebay	***Junction***		***Forebay***	***Junction***
Mean	199	186.8461538	Mean	92.25666667	75.40769231
Variance	80.82758621	362.8553846	Variance	157.474954	303.0119385
Observations	30	26	Observations	30	26
Pooled Variance	211.3960114		Pooled Variance	224.8531876	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	54		df	54	
t Stat	3.119741629		t Stat	4.193505654	
P(T<=t) one-tail	**0.00145163**		P(T<=t) one-tail	**5.13594E-05**	
t Critical one-tail	1.673565748		t Critical one-tail	1.673565748	
P(T<=t) two-tail	**0.00290326**		P(T<=t) two-tail	**0.000102719**	
t Critical two-tail	2.004881026		t Critical two-tail	2.004881026	